

ENTRY NO. FM-6

NAME OF MACHINE Goettingen Synchrocyclotron DATE 8/1/78
 INSTITUTION Universitaet of Goettingen, II. Physikalisches Institut
 ADDRESS Bunsenstr. 7-9, 3400 Goettingen/BRD
 IN CHARGE W.-D. Schmidt-Ott REPORTED by _____

HISTORY AND STATUS

DESIGN, date 1958 MODEL tests _____
 ENG. DESIGN, date _____
 CONSTRUCTION, date 1960-1962
 FIRST BEAM date (or goal) int. beam 1962
 MAJOR ALTERATIONS ext. beam 1962

OPERATION, 50 hr/wk; On Target 40 hr/wk
 TIME DIST., in house 90 %, outside 10 %
 USERS' SCHEDULING CYCLE 3 weeks
 COST, ACCELERATOR DM 4,2 x 10⁶
 COST, FACILITY, total DM 5,9 x 10⁶
 FUNDED BY Fed. Rep. of Germany

Building: Land of Niedersachsen
 ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS 1
 TECHNICIANS 2 CRAFTS _____
 GRAD STUDENTS involved during year _____
 OPERATED BY _____ Res staff or 2 Operators
 BUDGET, op & dev _____
 FUNDED BY Land of Niedersachsen

RESEARCH STAFF, not included above

USERS, in house 20 outside 5
 GRAD STUDENTS involved during year 10
 RES. BUDGET, in house _____
 FUNDED BY Land of Niedersachsen
Fed. Rep. of Germany

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 160 m²
 movable _____ m²
 TARGET STATIONS 5 in 2 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type _____
 COMPUTER, model LSI 11/03
 OTHER FACILITIES Gas-Transport-System
Facilities for Short-Lived
Spectroscopy and Chemical Separations

REFERENCES/NOTES

Cyclotron:
 W. de Groot: Philips Techn. Rev.
 Vol 12, No 3 (1950)
 G.T. de Kruiff, N.F. Vester: CERN-
 Report 63-19,80 (1963)
 Other Facilities; N. Instr. Meth.
130, 177 (75); 141, 553 (77)

MAGNET

POLE FACE diameter 180 cm; R extraction 75 cm
 GAP, min 35 cm; Field 14.5 kG } at .5 x 10⁶
 max _____ cm; Field _____ kG } ampere turns
 AVERAGE FIELD at R ext 14.2 kG
 CURRENT STABILITY 300 parts/10⁶; B_{max}/⟨B⟩ .99
 NUMBER OF SECTORS _____; SPIRAL, max _____ deg
 POLE FACE COIL PAIRS: AVF _____ /sec;
 Harmonic correction _____
 Rad grad _____ /sec or Circ coils _____
 WEIGHT: Fe 250 tons; Coils 2 tons
 CONDUCTOR, Material and type Aluminium
 STORED ENERGY .5 MJ
 COOLING SYSTEM Demineralized water
 POWER: Main coils 250 max, kW
 Trimming coils _____ max, kW
 YOKE/POLE AREA 113 %
 SECTOR ANGLE (Sep Sec) _____ deg
 ION ENERGY (Bending limit) E/A = 13.9 q²/A² MeV
 (Focusing limit) E/A = _____ q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
 BEAM APERTURE 10 cm; DC BIAS .5 kV
 TUNED by, coarse fixed fine variable cap.
 RF 10.6 to 11.1 MHz, stable ± _____ /10⁶
 Orb F same to _____ MHz; GAIN, max 13 kV/turn
 HARMONICS, RF/Orb F, used 1
 DEE-Gnd, max 20 kV, min gap fixed 7 cm
 STABILITY, (pk-pk noise)/(pk RF volt) _____
 RF PHASE stable to ± _____ deg
 RF POWER input, max 12 kW
 RF PROTECT circuit, speed 5 μsec
 Type DC and grid current monitors
 FREQUENCY MODULATION, rate 2000 /sec
 MODULATOR, type rotating capacitor
 BEAM PULSE, width 25 μsec

VACUUM SYSTEM

PUMPS, No., Type, Size Diff. pumps 6000 l/sec,
 modulator: 1000 l/sec
 OPERATING PRESSURE 2 μTorr,
 PUMPDOWN TIME 5 hrs

ION SOURCES/INJECTION SYSTEM

internal gas discharge (arc)

EXTRACTION SYSTEM

modified regenerative extr. with magn. channel

CONTROL SYSTEM

conventional

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CHARACTERISTIC BEAMS

| | Particle | Goal (MeV) | Achieved (MeV) |
|-----------|-----------------------|------------------|-------------------|
| ENERGY | d | 27 | 27.7 |
| | α | 54 | 55.4 |
| | | | |
| CURRENT | | | |
| Internal | d | (μ A) 10 | (μ A) 15 |
| | | 0.2 | 1.3 |
| External | 2 cm ² : d | | 0.1 |
| | α | | 0.01 |
| | | | |
| | | (part/s) | (part/s) |
| Secondary | | | |
| | | | |

BEAM PROPERTIES

| | Measured | Conditions |
|-------------------|--|----------------------------|
| Pulse Width | _____ RF deg | _____ μ A of _____ MeV |
| Phase Exc, max | _____ RF deg | _____ μ A of _____ MeV |
| Extract Eff | 5 % | _____ μ A of _____ MeV |
| Res, $\Delta E/E$ | 1 % | _____ μ A of _____ MeV |
| Emittance | (mm-mrad) { $\frac{100_{axial}}$ $\frac{100_{radial}}$ } _____ μ A of _____ MeV | |

OPERATING PROGRAMS, time dist

| | |
|--------------------------|------|
| Basic Nuclear Physics | 70 % |
| Solid State Physics | % |
| Bio-Medical Applications | % |
| Isotope Production | 25 % |
| Development | 5 % |
| | % |
| | % |

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES